





# Introduction

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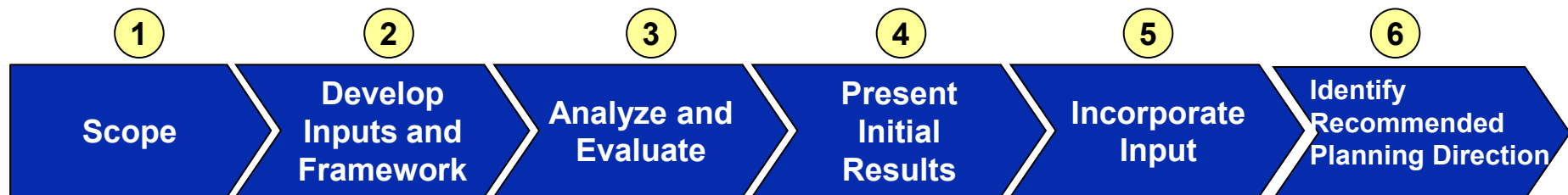
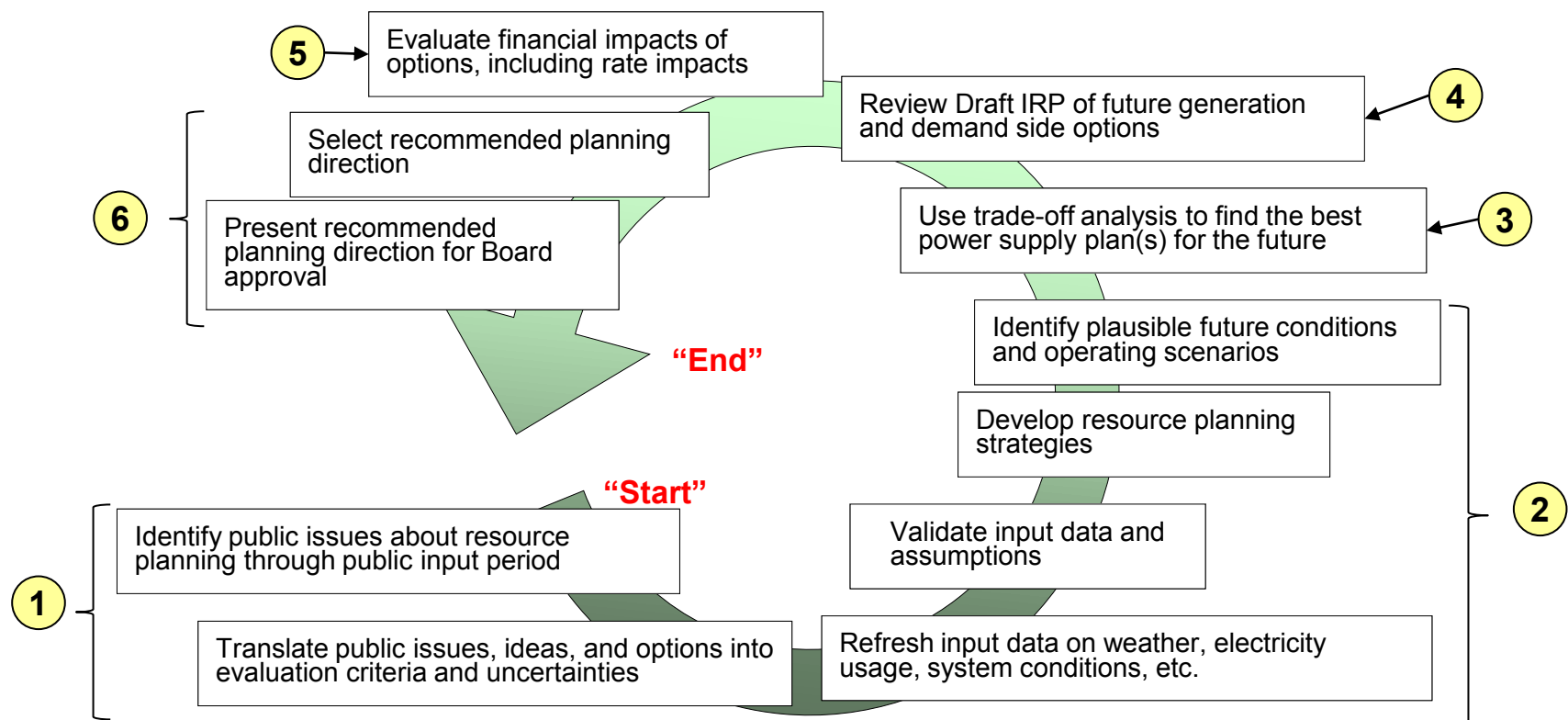
## SRG Purpose

- ◆ Provide TVA with in-depth ongoing discussion and input from different stakeholder viewpoints
- ◆ Serve as a source of information, a coordination mechanism, and a professional review group
- ◆ Build efficiency into the study process by providing real-time public input to IRP issues and processes
- ◆ Validate the various steps in the IRP process

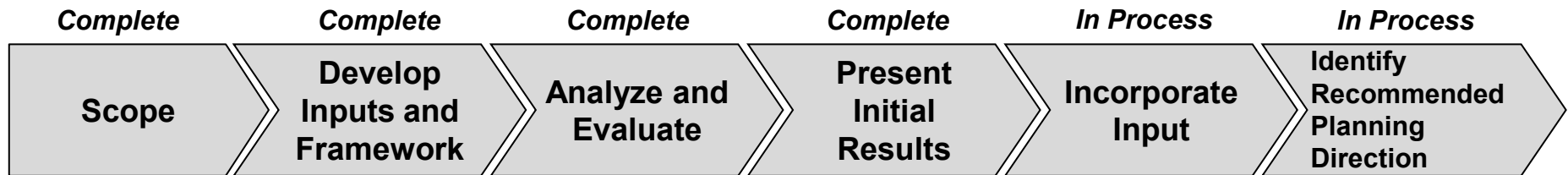
## SRG Meeting Types

- ◆ *Working Sessions* – regular meetings that are not open to the general public
- ◆ *Workshops* – the SRG, by majority vote, can request TVA hold additional “workshops” to provide more in-depth information on specific topics to those members who are interested in attending
- ◆ *Public Comment Sessions* – by majority vote, the SRG may host a public comment session to receive input on specific topics

### The IRP process is nearly complete



The SRG has reviewed and provided input on the following topics:



- ◆ Planning process
- ◆ Key uncertainties
- ◆ Updated scenario/worlds
- ◆ Demand-side resource options
- ◆ Supply-side resource options
- ◆ Busbar screening results for supply-side resource options
- ◆ Load forecast
- ◆ Environmental outlook
- ◆ Commodity price forecasts
- ◆ Financial parameters
- ◆ Energy efficiency and demand response
- ◆ Planning strategies
- ◆ IRP scorecard and evaluation metrics
- ◆ Preliminary model results

***Review of the Recommended Planning Direction***

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*Compass*



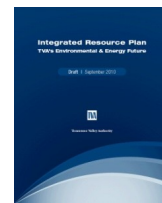
*GPS*



- ◆ The IRP is a compass; not a GPS
- ◆ It sets a strategic direction, but does not define a specific path
- ◆ Guideline ranges for components are described, but allow for flexibility in future decision making

# Review – Approach to Develop a Recommended Planning Direction

- Components from the planning strategies retained in the Draft IRP established the boundaries for optimization



Attributes	Range of Options Tested				
	EE/DR	Renewable Additions	Fossil Capacity	Renewable Additions	Fossil Capacity
EE/DR	– 2,100 MW & 5,900 annual GWh reductions by 2020	– 3,600 MW & 11,400 annual GWh reductions by 2020	– 5,100 MW & 14,400 annual GWh reductions by 2020		
Renewable Additions	– 1,500 MW competitive resources or PPAs by 2020	– 2,500 MW competitive resources or PPAs by 2020	– 2,500 MW competitive resources or PPAs by 2020	– 3,500 MW competitive resources or PPAs by 2020	– 3,500 MW competitive resources or PPAs by 2020
Fossil Capacity	– 2,400 MW total fleet reductions by 2017	– 3,200 MW total fleet reductions by 2017	– 4,000 MW total fleet reductions by 2017	– 4,700 MW total fleet reductions by 2017	

- A scorecard strategy was designed based on optimization results and ranking metrics scores
- Strategy components were selected from optimization cases that performed best across the scenarios tested

**Ranking Metric Worksheet**

	Idled Capacity	Scenarios			Total
		Sc 1	Sc 3	Sc 8	
Weighted Ranking	2,400				
	3,200				
	4,000				
	4,700				

- The proposed scorecard strategy is evaluated in all scenarios (cost and risk metrics were computed)

**Scenario Matrix**

	Scenarios							
	#1	#2	#3	#4	#5	#6	#7	#8
Optimized Strategy								

- These results were used to build a fully populated scorecard with ranking and strategic metrics
- The completed scorecard was compared with Draft IRP results to evaluate improvement over previously considered alternatives

**Fully Populated Scorecard**

Scenarios	Ranking Metrics					Strategic Metrics				
	Plan Cost	Short-Term Rate Impacts	Risk / Benefit	Risk Exposure	Total Plan Score	Environmental Stewardship			Economic Impact	
1	99.43	99.21	97.82	96.78	98.58	CO <sub>2</sub> Footprint	Water	Waste	Total Employment	Growth in Personal Income
2	100.00	99.22	99.79	100.00	99.80				0.8%	0.6%
3	99.15	96.03	95.91	97.73	97.72					
4	99.45	99.58	95.32	89.57	96.73					
5	99.83	99.50	98.87	99.47	99.56					
6	99.16	95.61	100.00	100.00	98.64				0.3%	0.2%
Baseline	99.68	99.77	98.98	98.96	99.45					
Total Ranking Metric Score					690.47					

**EEDR**

- ◆ Results evenly split in selecting either the 3,600 MW by 2020 portfolio and the 5,000 MW by 2020 portfolio

**Renewable additions**

- ◆ Model results tend to favor the current wind contracts (1,500 MW) as the least cost plan
- ◆ The renewable portfolio that delivers 2,500 MW by 2029 is selected in the dramatic load growth scenario

**Nuclear additions**

- ◆ Nuclear expansion is present in the majority of portfolios
- ◆ Up to two units are added at Bellefonte (B&W technology) between 2018 and 2022
- ◆ No additions are made in scenarios with nearly-flat load growth

**Coal additions**

- ◆ New coal capacity is only selected after 2025 in scenarios with dramatic load growth

**Natural gas additions**

- ◆ Expansion of natural gas is needed, but typically occurs after 2024 with simple-cycle combustion turbines
- ◆ The dramatic load growth scenario is an exception as combined cycles and combustion turbines are chosen as early as 2015
- ◆ Additional units may be required for reliability and/or grid stability





# Recommended Planning Direction

*Components as Proposed by Staff (2/22/11)*

Component	Guideline MW Range	Window of Time	Recommendations
EEDR	3,600-5,100 (11,400-14,400 GWh)	By 2020 <sup>1</sup>	◆ Expand contribution of EEDR in the portfolio
Renewable additions	1,500-2,500 <sup>2</sup>	By 2020 <sup>1</sup>	◆ Pursue cost effective renewable energy
Coal capacity idled	2,400-4,700 <sup>3</sup>	By 2017	◆ Increase amount of coal capacity idled
Energy storage	850	2020-2024	◆ Add pumped storage hydro capacity
Nuclear additions	1,150-5,900	2013-2029	◆ Increase contribution of nuclear generation
Coal additions	0-900	2025-2029	◆ Preserve option of generation with carbon capture
Natural gas additions	900-9,300	2012-2029	◆ Utilize natural gas as an intermediate supply source

1 – The 2020 range for EEDR and renewable energy does not preclude further investments in these resources during the following decade

2 – Values are nameplate capacity. Net dependable capacity would be lower

3 – MW values based on maximum net dependable capacity

**Future decisions that align with Recommended Planning Direction guideline ranges will minimize potential for regret**

# **TVA** Future Outcomes Will Impact Portfolio Decisions

Component	Key Considerations
EEDR	<ul style="list-style-type: none"> <li>— Success of partnership with diverse distributor group</li> <li>— Rate of customer adoption and demand for program offerings</li> <li>— Expansion of smart grid infrastructure</li> </ul>
Renewable additions	<ul style="list-style-type: none"> <li>— Timely build-out of transmission infrastructure to support out-of-Valley purchases</li> <li>— Development of economic in-Valley renewable options</li> </ul>
Coal capacity idled	<ul style="list-style-type: none"> <li>— Limits imposed by Hazardous Air Pollutants Maximum Achievable Control Technology (HAPs MACT) in 2015</li> <li>— Passage of federal climate change legislation and final decision on mercury and other particulates</li> </ul>
Energy storage	<ul style="list-style-type: none"> <li>— Operational challenges as generation mix changes</li> </ul>
Nuclear additions	<ul style="list-style-type: none"> <li>— Licensing and permitting timeline</li> <li>— Availability of key design and construction staff</li> </ul>
Coal additions	<ul style="list-style-type: none"> <li>— Successful demonstration of carbon-capture and sequestration at scale</li> </ul>
Natural gas additions	<ul style="list-style-type: none"> <li>— Cost and availability of natural gas supply</li> <li>— Grid stability requirements</li> </ul>





# IRP Table of Contents

- ◆ Executive Summary
- ◆ Chapter 1 – TVA's Environmental and Energy Future
- ◆ Chapter 2 – IRP Process
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- ◆ Chapter 4 – Need for Power Analysis
- ◆ Chapter 5 – Energy Resource Options
- ◆ Chapter 6 – Resource Plan Development and Analysis
- ◆ Chapter 7 – Draft Study Results
- ◆ Chapter 8 – Final Study Results and Recommended Planning Direction
- ◆ Chapter 9 – Next Steps

**Today's discussion will review key elements of the Final IRP**

- ◆ The executive summary provides a condensed version of key topics and results in the IRP including:
  - Public participation
  - Need for power analysis
  - Approach
  - Recommended Planning Direction

## IRP Strategic Findings

- ◆ Expanded EEDR portfolios perform well; the mid-level portfolio provides the best balance of cost and implementation risk
- ◆ Renewable generation above existing wind contracts plays a role in future resource portfolios assuming certain costs
- ◆ Increased idled coal capacity is favorable compared to maintaining the existing fleet
- ◆ Coal capacity is only added in scenarios with high load growth
- ◆ Pumped storage adds needed operational flexibility
- ◆ Nuclear expansion is selected in most cases except scenarios with no load growth
- ◆ Natural gas capacity is selected in most cases after 2020 except when needed earlier to meet high load growth or to provide grid reliability

## Chapter 1 – TVA's Environmental and Energy Future

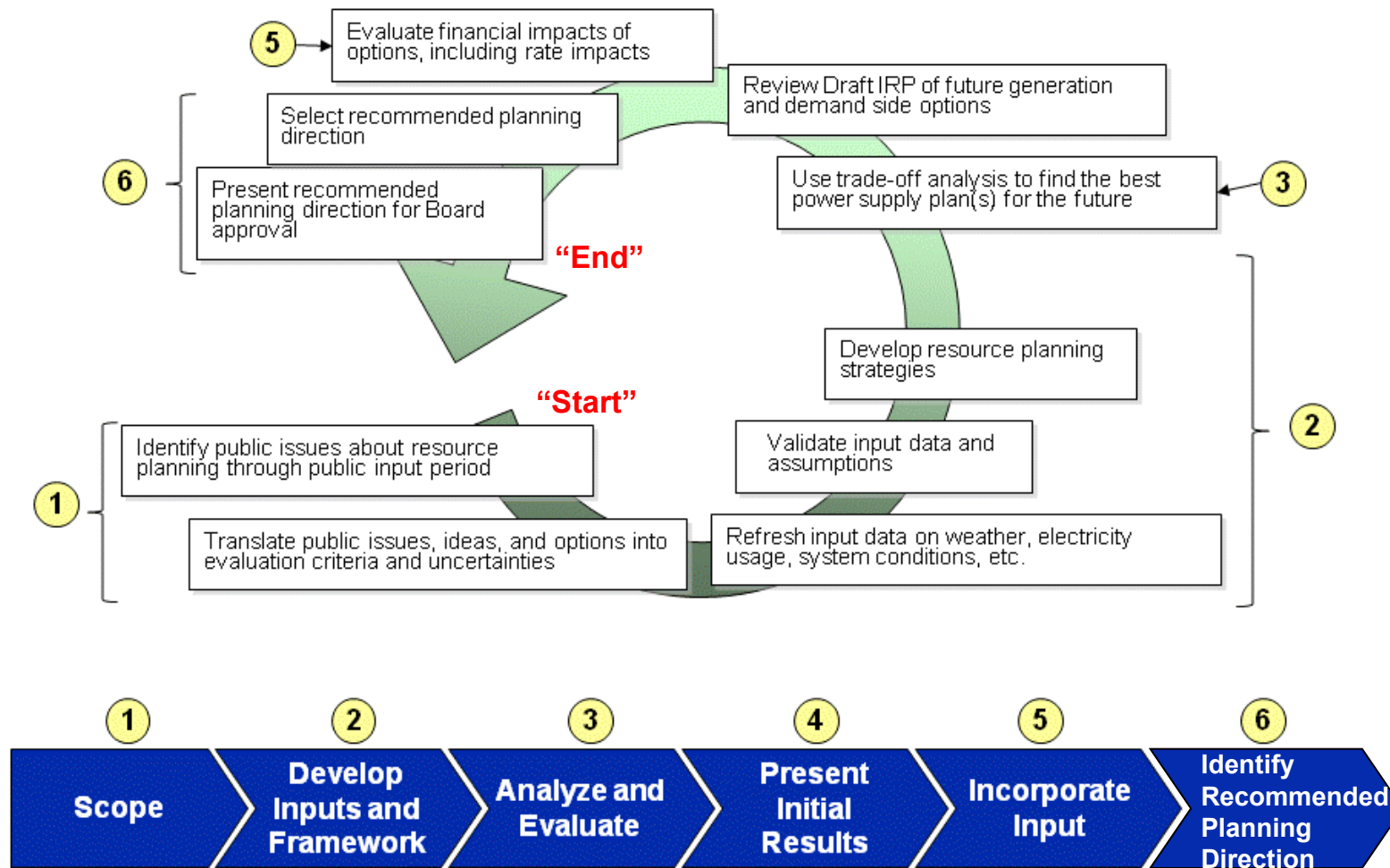
- ◆ Provides a brief description of TVA history, mission, current operations/system
- ◆ Describes the role of the IRP, process, and guiding principles
- ◆ Summarizes key deliverables

### Strategic Principles of IRP Development

- Mitigate risk at a reasonable cost
- Balance our generation resources to reduce supply and price risk
- Balance production and load
- Minimize environment impacts of portfolio
- Incentivize load sources to optimize load factor
- Provide flexibility to adapt to changing market conditions and future uncertainty
- Improve TVA's credibility and image through a comprehensive, balanced and transparent approach
- Integrate perspectives of internal and external stakeholders throughout the process

## Chapter 2 – IRP Process

- Explains the key steps of the IRP development process at the beginning of the document (a new addition from the Draft IRP)



## Chapter 3 – Public Participation

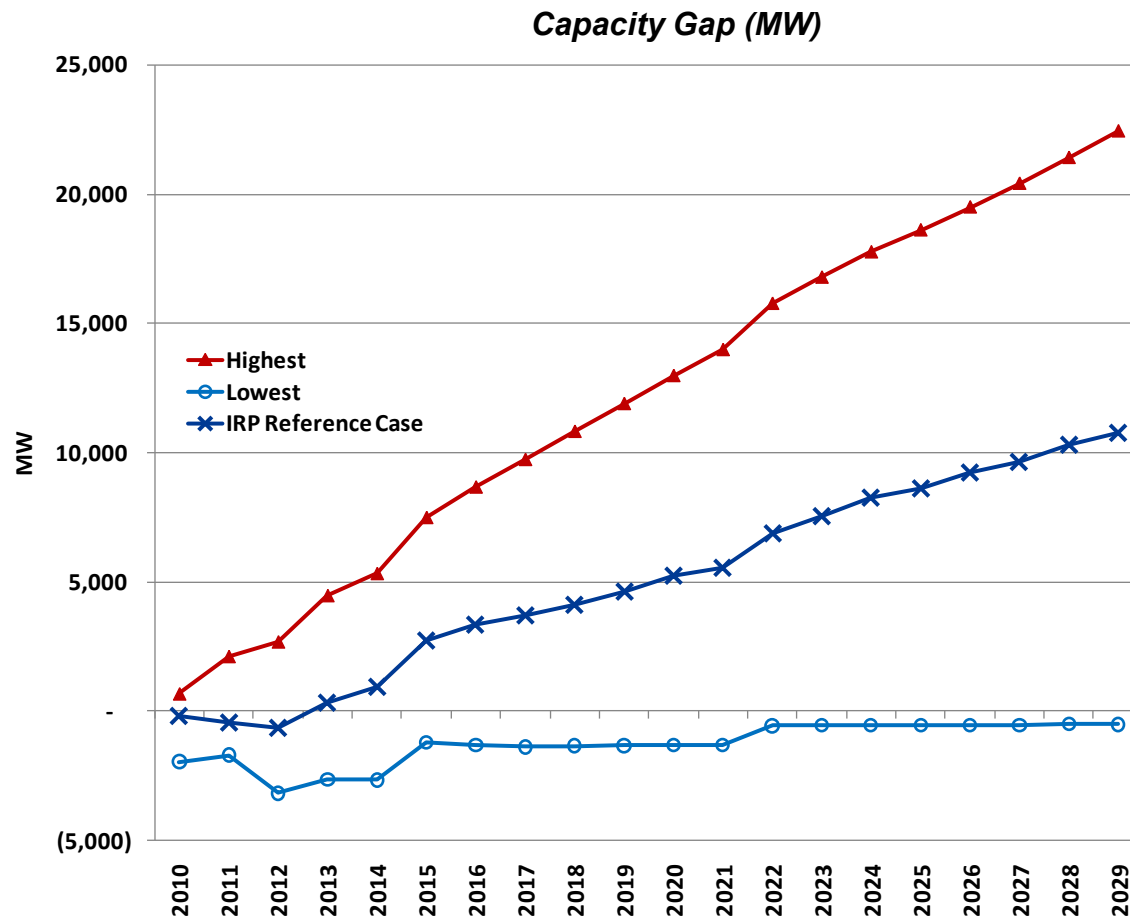
- ◆ Describes the methods for engaging public input throughout the process

Forum for Public Input	Purpose	Timing and Frequency
Public Scoping Meetings	— Provided input to IRP scope	— Conducted 7 meetings Summer 2009
Stakeholder Review Group (SRG)	— Obtained input from different stakeholder viewpoints	— Established in July 2009 — Conducted 14 meetings to date
Quarterly Public Briefings	— Provided update on IRP development and answered questions	— Hosted quarterly since November 2009
Phone Survey	— Surveyed 1,000 end-use customers across the Valley	— Completed Summer 2010
Draft IRP Public Comment Period	— Presented an overview of the Draft IRP followed by a moderated Q&A session	— Hosted 5 public meetings and webinars in October 2010
External Web Page ( <a href="http://www.tva.gov/irp">www.tva.gov/irp</a> )	— Shared information on IRP development	— Updated as new content was available



## Chapter 4 – Need for Power Analysis

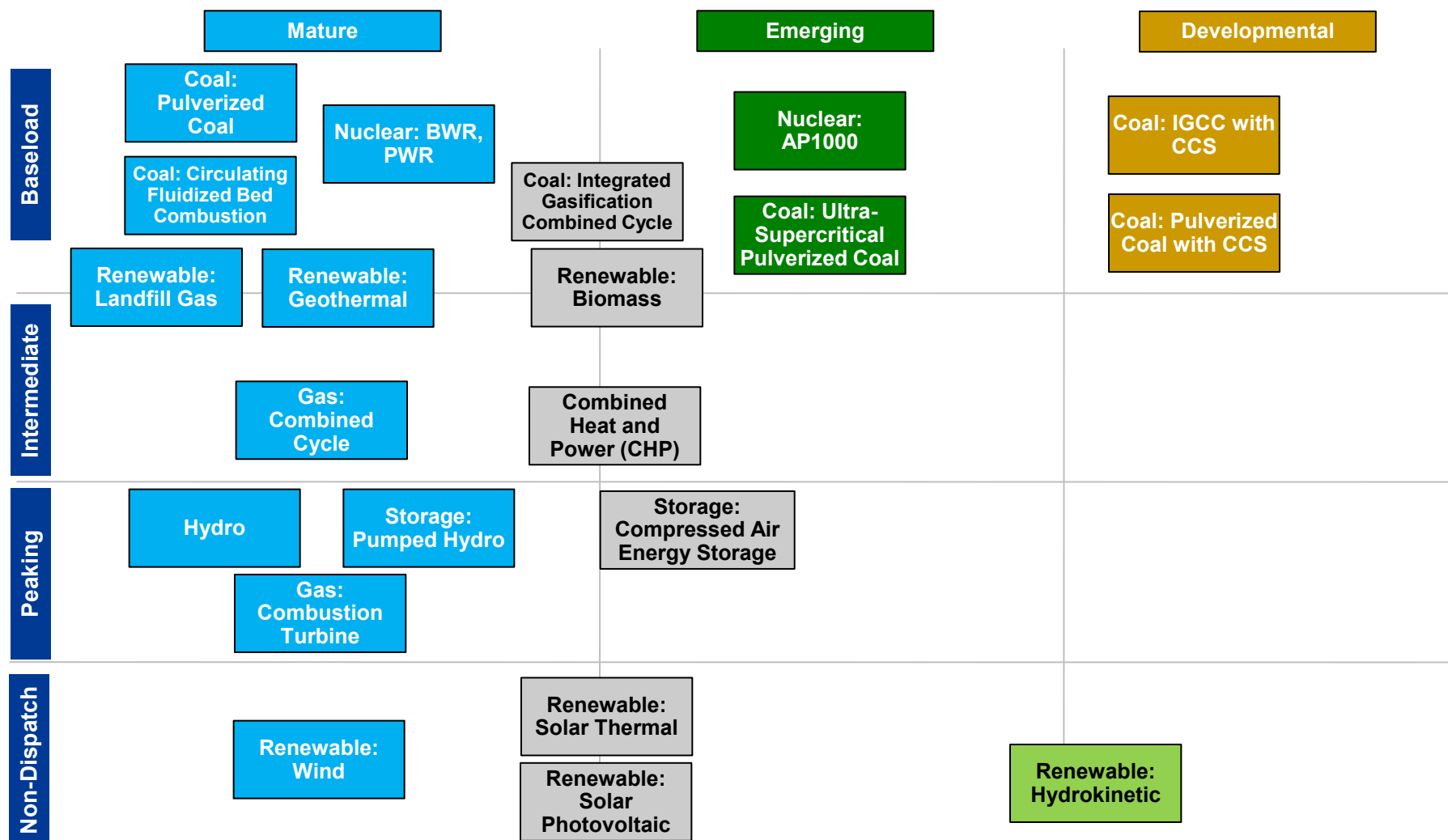
- ◆ Describes the analysis and key components used to establish the need for power



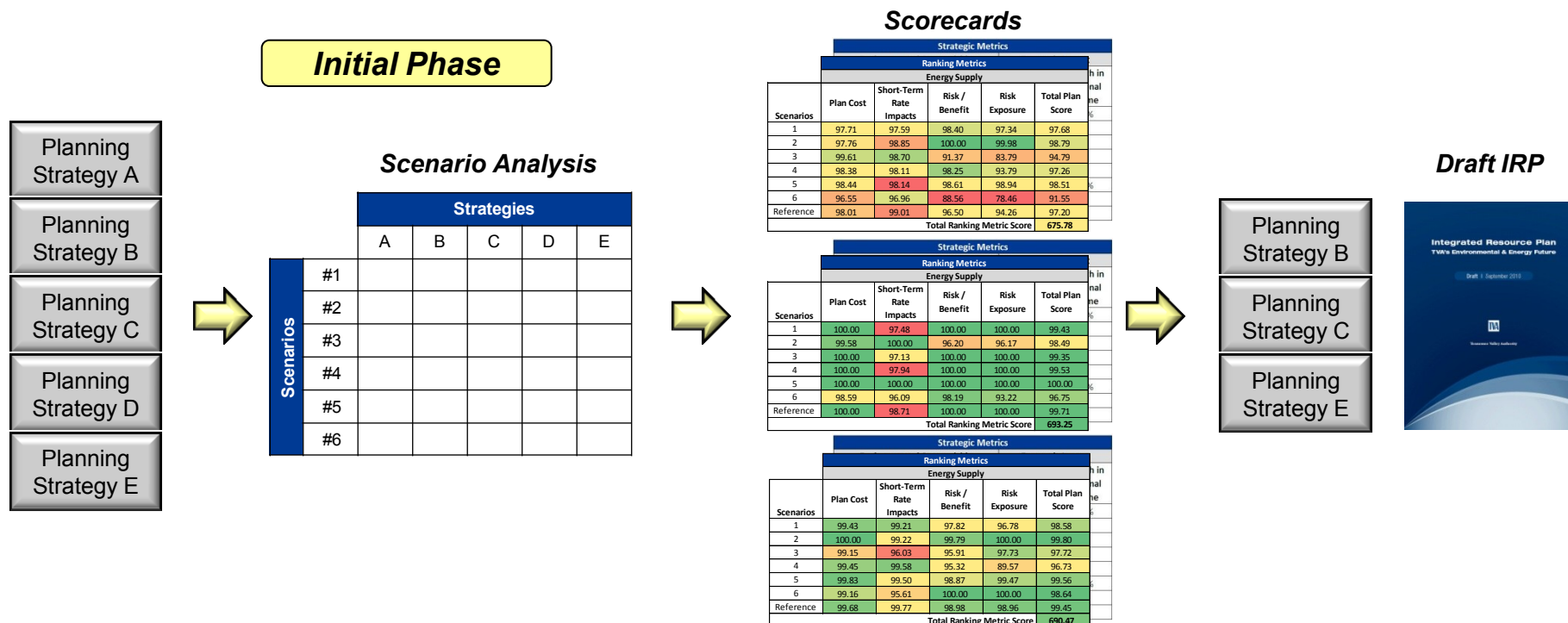
**A need for power is established because the forecasted demand plus reserve margin exceeds existing resources in the majority of scenarios**

## Chapter 5 – Energy Resource Options

- Details the energy resource options considered in the IRP including EEDR, market supply and the following supply side technologies:



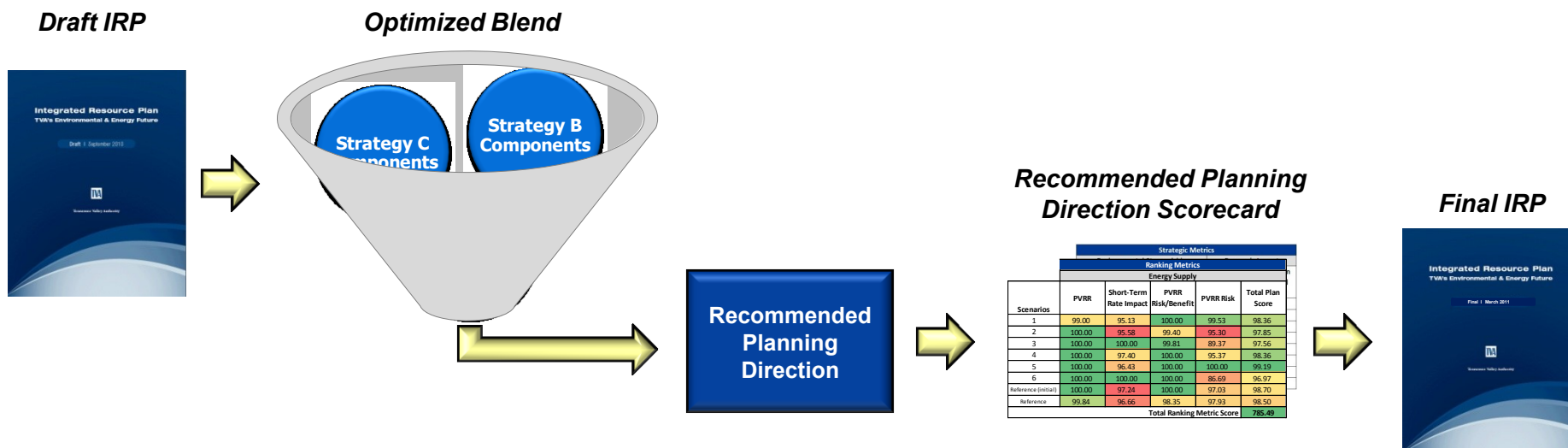
## Chapter 6 – Resource Plan Development and Analysis



- ◆ Evaluated multiple planning strategies across a range of possible futures (scenarios)
- ◆ Compared the relative performance of initial planning strategies using scorecards based on scenario analysis results
- ◆ Retained the highest ranking planning strategies in the Draft IRP for further evaluation

## Chapter 6 – Resource Plan Development and Analysis (Cont'd)

### Final Phase



- ◆ Optimized and evaluated resource combinations through analysis of over 3,000 cases
- ◆ Examined analysis results, stakeholder input, and no regrets considerations
- ◆ Identified a Recommended Planning Direction that represents the most favorable blending of resource components and is the strongest performer with the lowest likelihood of regret

## Chapter 7 – Draft Study Results

- ◆ Presents the key results from the Draft IRP including:
  - Completed IRP scorecards with ranking metrics and strategic metrics
  - Recommended planning strategies to retain for further analysis
  - Example implementing portfolios
  
- ◆ Implications of preliminary results
  - Planning strategy C was the best performer with planning strategy E a close second
  - Planning strategy B was retained in the Draft to represent the “no action” alternative in the EIS
  - Planning strategies A and D are the worst performers and were removed from further consideration

**Ranking Metric Results**

Rank	Planning Strategies	
1	C - Diversity Focused Resource Portfolio	
2	E - EE/DR and Renewables Focused Resource Portfolio	
3	B - Baseline Plan Resource Portfolio	
4	D - Nuclear Focused Resource Portfolio	<b>X</b>
5	A - Limited Change in Current Resource Portfolio	<b>X</b>

## Chapter 8 – Final Study Results and Recommended Planning Direction

- ◆ Describes the process for developing the Recommended Planning Direction
- ◆ Presents the Recommended Planning Direction
- ◆ Illustrates how the Recommended Planning Direction could be implemented over a variety of possible futures
- ◆ Compares the performance of the Recommended Planning Direction to the strategies retained in the Draft IRP
- ◆ Discusses other considerations that were incorporated into the process

### Illustrative Portfolios

Year	Capacity Additions by Scenario									
	EEDR	Renewables	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
2010	300 MW	300 MW	PPAs							
2011										
2012			JSF CC	JSF CC	JSF CC	JSF CC	JSF CC	JSF CC	JSF CC	JSF CC
2013			WBN 2 PPAs	WBN 2	WBN 2	WBN 2	WBN 2	WBN 2	WBN 2	WBN 2
2014			CT			CTb PPAs				
2015			CC			CC	CTb		CTb	CTb
			CTb							
			CT							
			PPAs			PPAs	PPAs		PPAs	PPAs
2016			CT			CT	MKT		MKT	MKT
2017			MKT			MKT			MKT	
2018			BLN 1	BLN 1		BLN 1			BLN 1	
2019			MKT			MKT	MKT		MKT	MKT
2020	3,600 MW	2,500 MW	BLN 2 PSH	BLN 2 PSH	PSH	BLN 2 PSH	BLN 1 PSH	PSH	BLN 2 PSH	BLN 1 PSH
2021			CC							
2022			CC MKT				BLN 2			BLN 2
2023			CT MKT						CT	
2024			NUC							
2025			IGCC MKT						CT	
2026			NUC						MKT	CT
2027			CT				MKT		CT	MKT
2028			CT				CT		MKT	CT
2029	4,600 MW	2,600 MW	CT IGCC	CT			CT		CT	CT

\*Illustrative portfolios assume 4,000 MW of idled fossil capacity by 2015

## Chapter 9 – Next Steps

Issue	Recommendations
◆ Idling coal-fired units	— Perform detailed optimization analyses to determine both the optimum level of idling and the best units for idling after accounting for costs, risks, uncertainty and all known costs
◆ Renewables	— Analyze renewable technologies and business models and monitor market trends for strategic options to develop cost-effective renewable resources
◆ Nuclear power	— Complete project specific evaluation of B&W technology at Bellefonte site and refine timing
◆ EEDR	— Measure and verify results of new programs and reevaluate contribution as necessary
◆ Pumped-storage	— Study more detailed project economics of and justification for additional pumped-storage with a goal of making a recommendation on how to proceed
◆ Stakeholder involvement	— Solicit input from external stakeholders and incorporate into the next IRP
◆ Next TVA IRP	— Commit to starting the next IRP by 2015





# Stakeholder Input – Clean Energy and Resource Mix

Input from Stakeholders	Response
<ul style="list-style-type: none"><li>— The use of natural gas should be significantly expanded</li></ul>	<ul style="list-style-type: none"><li>— The Recommended Planning Direction supports a broad range of potential natural gas capacity expansion</li></ul>
<ul style="list-style-type: none"><li>— Capability for energy storage should be increased</li></ul>	<ul style="list-style-type: none"><li>— A pumped storage hydro unit was included in the development of the Recommended Planning Direction</li></ul>
<ul style="list-style-type: none"><li>— Renewable investment (particularly within the Valley) should be increased</li></ul>	<ul style="list-style-type: none"><li>— Renewable portfolios were expanded beyond existing contracts and include in-Valley resources</li></ul>
<ul style="list-style-type: none"><li>— Biomass is the most viable renewable resource within the Valley and should be expanded</li></ul>	<ul style="list-style-type: none"><li>— Biomass is included in the renewable portfolios evaluated in the IRP</li></ul>
<ul style="list-style-type: none"><li>— A strategy that does not include nuclear after WBN2 should be considered</li></ul>	<ul style="list-style-type: none"><li>— Planning Strategy A (Limited Changed) did not allow any capital expansion beyond WBN2</li></ul>

## Input from Stakeholders

- A large amount of the aging coal fleet should be idled to consider the impacts of more stringent environmental requirements
- Contribution of EEDR should be increased
- Price forecast for natural gas should be lower based on emergence of shale gas
- Forecast should not change because shale gas has yet to be demonstrated as a reliable source of supply
- Combined Heat and Power (CHP) should be included as a resource option
- EEDR and renewable portfolios with significant growth beyond 2020 should be evaluated

## Response

- Breadth of idled fossil capacity considered was expanded
- Range of EEDR considered in the planning strategies was broadened
- Forecast is based upon recent market conditions as well as long-term economic views of the market that include shale gas
- CHP can be selected as part of the market supplied power identified by the IRP
- An additional sensitivity with EEDR and renewable portfolios that grew dramatically after 2020 was tested

# Stakeholder Input – Process and Public Engagement

Input from Stakeholders	Response
— The public should have more opportunities to interact with the IRP process	— TVA initiated quarterly briefings with the public in November 2009
— TVA should explore alternatives that allow for greater participation in public events	— TVA began broadcasting public meetings via webinar in February 2010
— Potential economic impacts of carbon legislation being implemented were not represented in scenarios	— Scenario 6 (Carbon Legislation Creates Economic Downturn) was created to address this concern
— Scenarios should reflect forecasts for demand that are flat and possibly negative	— Two scenarios considered nearly-flat load growth and slightly negative growth
— Other emissions should be added as a separate environmental measure from CO <sub>2</sub> emissions	— TVA determined that CO <sub>2</sub> emissions were a suitable proxy for other emissions
— Engagement with distributors is the key to successfully implementing EEDR programs	— TVA is committed to maintaining a strong partnership with the power distributors
— Distributor-owned generation should be increased	— TVA is engaged in dialogue to identify opportunities for distributor-owned generation outside the IRP

Input from Stakeholders	Response
<ul style="list-style-type: none"> <li>— New approaches that combine components of different planning strategies should be tested</li> </ul>	<ul style="list-style-type: none"> <li>— Analysis to identify the Recommended Planning Direction optimally selected components</li> </ul>
<ul style="list-style-type: none"> <li>— A technology innovation metric is out of context for the IRP and should not be included in the IRP scorecard</li> </ul>	<ul style="list-style-type: none"> <li>— Technology innovation was included as a separate discussion from the IRP scorecard</li> </ul>
<ul style="list-style-type: none"> <li>— Graphical indicators for economic impact in the IRP scorecard may imply greater differences than actually exist</li> </ul>	<ul style="list-style-type: none"> <li>— The IRP scorecard was modified to show the percentage difference from the baseline for economic impacts</li> </ul>
<ul style="list-style-type: none"> <li>— Strategic metrics should be populated for all planning strategies considered in the Draft IRP</li> </ul>	<ul style="list-style-type: none"> <li>— Process was modified to create fully populated scorecards for all planning strategies</li> </ul>
<ul style="list-style-type: none"> <li>— TVA should use “true cost accounting” to monetize all external impacts related to operations</li> </ul>	<ul style="list-style-type: none"> <li>— TVA uses industry standard methods for accounting for project and operations cost</li> <li>— Environmental impact measures are included in the IRP scorecard</li> </ul>
<ul style="list-style-type: none"> <li>— Requests were received to extend the 45-day public comment period on the Draft IRP</li> </ul>	<ul style="list-style-type: none"> <li>— The public comment period was extended 7 days to allow additional time to submit comments</li> </ul>
<ul style="list-style-type: none"> <li>— The IRP should be a recurring process for TVA</li> </ul>	<ul style="list-style-type: none"> <li>— TVA has committed to begin the next IRP process by 2015</li> </ul>

# The SRG Has Been Successful in Fulfilling its Purpose

Stakeholder Review Group Purpose	Achieved
— Provided TVA with in-depth ongoing discussion and input from different stakeholder viewpoints	✓
— Served as a source of information, a coordination mechanism, and a professional review group	✓
— Built efficiency into the study process and provided real-time public input to IRP issues and processes	✓
— Validated the various steps in the IRP process	✓

**The SRG has successfully represented different viewpoints and provided valuable input throughout the development of the IRP**

***Next Steps***

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# TVA High-Level IRP Project Schedule and Next Steps

